

Unit 6: Solving Systems of Linear Equations Algebraically

6.2 Solving Systems of Linear Equations by Substitution

Substitution Method:

Ex. Solve

$$4x + 5y = 26$$

$$3x = y - 9$$

$$y = 3x + 9$$

$$4x + 5(3x + 9) = 26$$

$$4x + 15x + 45 = 26$$

$$19x + 45 = 26$$

$$19x = -19$$

$$x = -1$$

$$y = 3(-1) + 9$$

$$y = 6$$

check

$$4(-1) + 5(6) = 26$$

$$-4 + 30$$

$$26 = 26 \checkmark$$

$$3(-1) = 6 - 9$$

$$-3 = -3 \checkmark$$

- Isolate a single variable in one of the two equations (If possible choose a variable with a coefficient of 1)
- Substitute the expression into the other equation and solve one of the variables
- Substitute the first variable solution into either original equation and solve for the remaining variable
- Verify your solution by substituting into both original equations

Ex. Solve

$$2x + y = 13 \rightarrow y = -2x + 13$$

$$x - 0.4y = -16$$

$$\times 10$$

$$10x - 4y = -160$$

$$10x - 4(-2x + 13) = -160$$

$$10x + 8x - 52 = -160$$

$$18x - 52 = -160$$

$$18x = -108$$

$$x = -6$$

$$\text{OR } (-6, 25)$$

$$y = -2(-6) + 13$$

$$y = 25$$

Ex. Solve

$$\frac{2}{3}x + \frac{3}{5}y = -2$$

$$\frac{x}{6} - \frac{y}{2} = -7$$

$$\frac{5}{15}\left(\frac{2}{3}x\right) + \frac{3}{15}\left(\frac{3}{5}y\right) = 15(-2)$$

$$10x + 9y = -30$$

$$6\left(\frac{x}{6}\right) - 3\left(\frac{y}{2}\right) = 6(-7)$$

$$x - 3y = -42$$

$$+3y \quad +3y$$

$$x = 3y - 42$$

$$10(3y - 42) + 9y = -30$$

$$30y - 420 + 9y = -30$$

$$39y - 420 = -30$$

$$+420 \quad +420$$

$$39y = 390$$

$$y = 10$$

$$x = 3(10) - 42$$

$$x = -12$$

Ex. At a dance recital, there were 220 people. Tickets cost \$9 for an adult and \$6 for a child. The dance collected \$1614 in ticket sales. How many adults and how many children attended the recital?

Let $a = \# \text{ adults}$
 $c = \# \text{ children}$

$$\begin{array}{r} a + c = 220 \\ -a \\ \hline \end{array}$$

$$c = -a + 220$$

$$\begin{array}{l} c = -98 + 220 \\ c = 122 \end{array}$$

$$9a + 6c = 1614$$

$$9a + 6(-a + 220) = 1614$$

$$9a - 6a + 1320 = 1614$$

$$\begin{array}{r} 3a + 1320 = 1614 \\ -1320 \\ \hline \end{array}$$

$$\frac{3a}{3} = \frac{294}{3}$$

$$a = 98$$

98 adults & 122 children

Practice: WS163 – work on separate sheet
 pg. 474/#4b, 5, 6, 7, 9 – 12